Ballistic Calculator RT12

Universal artillery calculator: 6400 / 6000 mil, MGRS, CK42, Lt/Lg, METCM / Метео11, multilingual day/night interface, boussole, astronavigation.

Range tables for the systems: 2S5, 2A36, 2S19, 2A65, 2S3, 2A33, 2S7, 2A18, 2S19, MT12, 2S12, 2B14, 2B9 and projectiles: OF29, OF45, OF25, OF540, ZOF43, OF24, OF462, BK3, OF15, OF843B, O832. Enables setting-up and customization of additional tables.

Available on Google Play Store.

Functionality

Enables rapidly deployable and accurate all-weather twenty-four-hour fires in a fluid battlespace. Ensures the agility required in an environment of high-tempo non-linear battlefields with constant moves from one firing position to another. Enables laying the battery using the smartphone's composite sensor.

Allows for transition between the range tables for a variety of rocket or round types, should the artillery officer decide to utilize varied ammunition across a short timespan.

Operates with 6400 mil, 6000 mil and 360-degrees angle measurement systems and with MGRS, SK42 or Geographical cartographic systems.

To ensure full autonomy of operation, the system can be used as GPS-independent with an ability to automatically modify the user's position supported by astronavigation and geodesic functionality.

Organic dark theme (night) view. English, French, German or Ukrainian interfaces.

Meteorological data in Метео-11 or METCM formats.

Navigation:

The no-frills smart-phone interface is carefully engineered for maximum convenience, efficiency and consistent performance on a broad range of Android devices.

All navigation is done by clicking/sliding on images, icons, arrows, words or numbers. There are no drop-down menus. Selection from a list of items is done by multiple clicking. For example, the selection of a desired language is done by clicking on a displayed language in the setup until it is as required.

All lists are revolving. Clicking ↑ or ↓ pushes the list by one line up or down.

Most changes after a single click are immediately recorded in the data base and instantly impact the entire application. A single exception to a one-click principle is the re-set of the data base to original 'as purchased' data. Due to its broad impact, it requires an additional confirmation by a second click.

There is no un-do button - all changes are irreversible. However, the application is designed in a way that any changes other than the one described above, have a limited scope, so while they cannot be un-done, they can be easily re-done.

Schema notation:

	Firing position		101	Target	▲	Observer
	Wind direction		✕	Observed blast	/	Max range
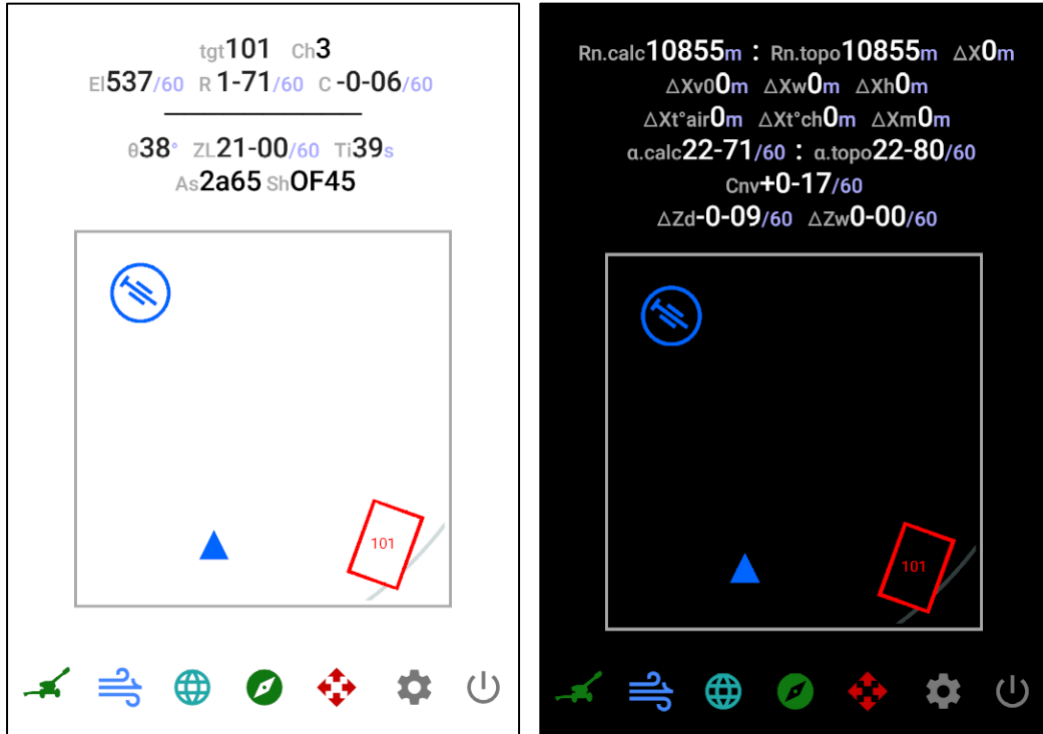
Home view

All basic information needed for the determination of fire commands for pieces is displayed on the top of the home view (referred to as "status bar"):

Tgt   Target (concentration) number.

Ch   Selected charge: Full, Reduced, Base, Super-charge, 1, 2, 3, 4, 5, 6.

OOR   Out of Range

El   Quadrant Elevation in the selected units: mils/60, mils/64, degrees, mils/60M
(used for some mortars so 45deg=1000mils)

R / L   Right / Left from ZL

C / S   Converge / Open sheaf

The above basic info is followed by some additional data:

θ   Angle of fall in degrees

ZL   Grid Azimuth of Zero Line of fire in the selected units: mils/60, mils/64, degrees.

Ti   Time of flight in seconds

As   Selected artillery system.

Sh   Selected projectile and deviation of its weight.

Clicking on the status bar switches between 1) basic information and 2) details of meteorological and ballistic adjustments.

Bottom navigation bar:

The bottom bar options lead to the main domains:

Selection of artillery system, type of projectile, fuze, charge and review (or input) tabular firing range tables.

Ballistic deviations, Projectile weight deviation and Meteorological data.

Coordinates and other basic geometry for Firing position, Target and Observer.

Boussole / Compass: Offers a possibility for laying the battery based on device's composite sensor.

Correction: 1) Right/Left/Over/Short or 2) N/S/E/W.

Setup: selection of language, MGRS / SK42 / Geo coordinate system, Day/Night, METCM / Метео11, Air Pressure units of measurement, Temperature °C / °F, Wind direction Degrees / Mils-64 / Mils-60, re-stating of the original settings.

Exit.

Range tables

Clicking on the schema rotates among: Artillery system → Projectile/Fuze → Charge → Range table records → Artillery system.

Systems 1001 and 1002 and projectile 1000 are customizable to configure a desired range table when it is not readily available in the built-in data-base.

Bottom navigation bar:

In the review mode, transfers to the home view. The selected system, projectile and charge will be retained for the calculations.
In the edit mode (systems 1001 and 1002 only) will exit editing without saving the entered data.

Saves the customized firing table records (systems 1001 and 1002 only).

Switches between the artillery system, projectile, charge and firing table views.

Switches artillery systems, projectiles, charges or scrolls the firing table records.

Pre-set configurations:

System	Projectile / Fuze	Charge
2S5	OF29	2/1/R/F
2A36	OF29	2/1/R/F
2S19	OF45	5/4/3/2/F/S
2A65	OF45	5/4/3/2/F/S
2A65	OF25; OF-540; OF-540Zh	5/4/3/2/F
2S3	OF540 / RGM2	6/5/4/3/2/1/F
2S3	OF540 / B90	3/2/1/F
2A33 D-20	OF540 / RGM2	6/5/4/3/2/1/F
2S7	ZOF43	3/2/1/F
2A18 D-30	OF24	4/3/2/1/R/F
2S1 2S19	OF462	4/3/2/1/R/F
MT12	BK3	F
MT12	OF15	F
2S12	OF843B	1/2/3/4/5/6/S
2B14	O832	B/1/2/3/S
2B9	O832	F

Variables:

As	Selection of an artillery system.
Sh	Selection of a projectile.
Ch	Selection of a charge: 1, 2, 3, 4, 5, 6, Full, Reduced, Base, Super-charge.
caliber	Can be customized for the systems 1001 and 1002.
Caliber UoM	Caliber units of measurement: mm / in
Azimuth UoM	Azimuth units of measurement: mils/60, mils/64, degrees
Spin	Rifling of the tube: Right, Left (Japanese systems) or No (mortars)
El UoM	Elevation units of measurement: mils/60, mils/64, degrees, mils/60M (used for some mortars so 45deg=1000mils)
max	Maximum elevation in the chosen UoM
min	Minimum elevation in the chosen UoM (cannot be less than zero)
mass	Weight of projectile
weight UoM	Weight units of measurement: kg / lb
range	Radius in meters
Muzzle velocity	In meters per second
Rn	Range in meters
El	Elevation
ΔZd	Drift
ΔZw	Wind component perpendicular to the direction of fire
ΔXw	Wind component parallel to the direction of fire
ΔXh	Impact of air pressure
ΔXt°air	Impact of 10^0C variation in air temperature on a variation in range
ΔXt°ch	Impact of 10^0C variation in propelling charge temperature on a variation in range

Meteorological and Ballistic Data, Projectile weight deviation

Clicking on the schema rotates among the altitudes: 200м → 500м → 1000м → 1500м → ... → 30000м.

METEO-11 vs METCM are selected in the Setup.
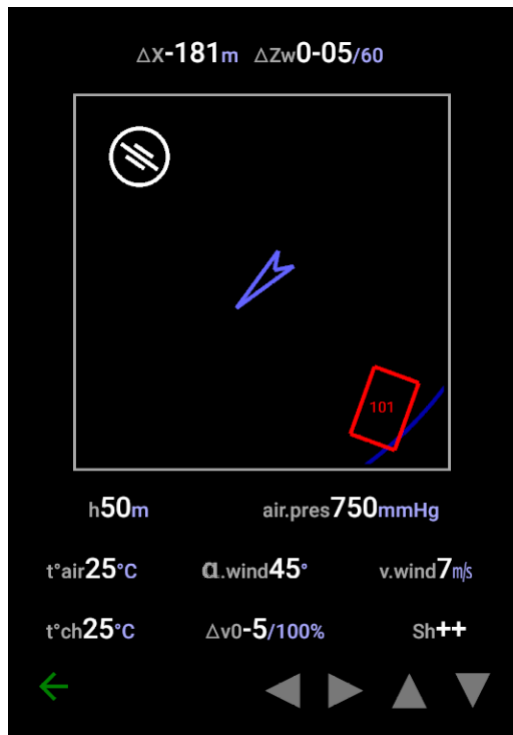
Bottom navigation bar:

←	Go to the home view without saving.
🖫	Save the data.
◀ ▶	Switch to the next / previous altitude layer.
▲ ▼	Switch to the next / previous altitude layer.

For the operational convenience, the entered data gets copied upwards, for example a record for the altitude 1000m gets copied to the altitudes 1500m, 2000m and so on till the 30000m. As a result, data must be entered bottom up.

Coordinates

Clicking on the schema rotates among:

1. Firing position

2. Target   101

3. Observer

The application operates with both 6400 mil and 6000 mil angle measurement systems, measurement in degrees and with MGRS, SK42 or Geographical cartographic systems in both hemispheres. Neither polar regions nor Norway zones are supported.

Spheroid semi-diameters: SK42 :   6378245 м X 6356863.019 м
                                     MGRS :   6378137 м X 6356752.314 м

There is a difference between MGRS and SK-42 interfaces - MGRS zone takes place of the position/target name, which is moved to the status bar. Notation of the grid zone designator (GZD) according to MGRS-New AA schema.
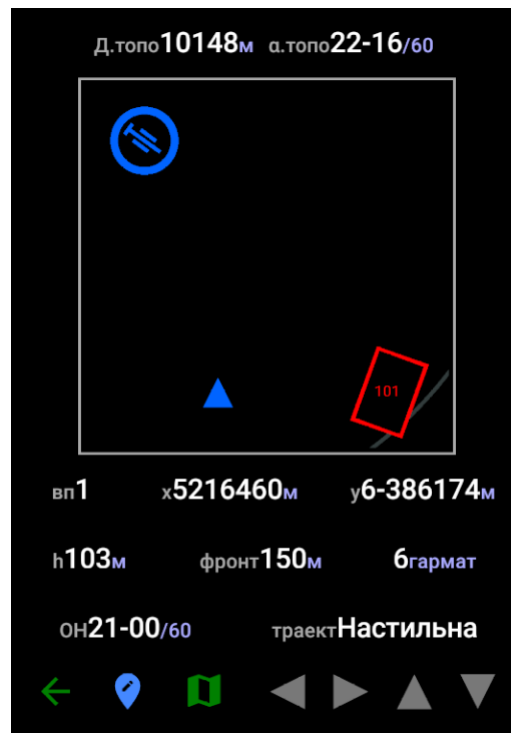
Status bar indicates the distance from the selected firing position to the selected target.

Clicking on the Charge (Ch) in the firing position sub-view transfers to the charge selection.

Any input data gets verified and automatically adjusted in case of inconsistencies. For example, there must be at least two guns in a battery. If a user enters zero guns, upon saving, the system will automatically replace zero with two.

Bottom navigation bar:

Icon	Description
←	Go to the home view with saving of selected firing position, target and observer.
(GPS pin)	Get GPS data. Requires enabled GPS positioning.
(camera)	Only in Target view if there was already taken a photo from the selected Observer point. Displays targets on the taken photo and enables direct geo solutions.
(map)	Google Maps.
(save)	Save the data.
◀ ▶	Switches between firing position, target and observation point.
▲ ▼	Switches recorded positions, targets or points.

tgt**101** Rn.topo**10148**m a.topo**22-16**/60

36TUT   e**3-93625**m   n**52-09449**m

h**143**m   front**300**m   d**200**m

ang**48-33**/60

Д.топо**10148**м a.топо**22-16**/60

ціль**101**   x**5209541**м   y**6-393623**м

h**143**м   фронт**300**м   глиб**200**м

кут**48-33**/60
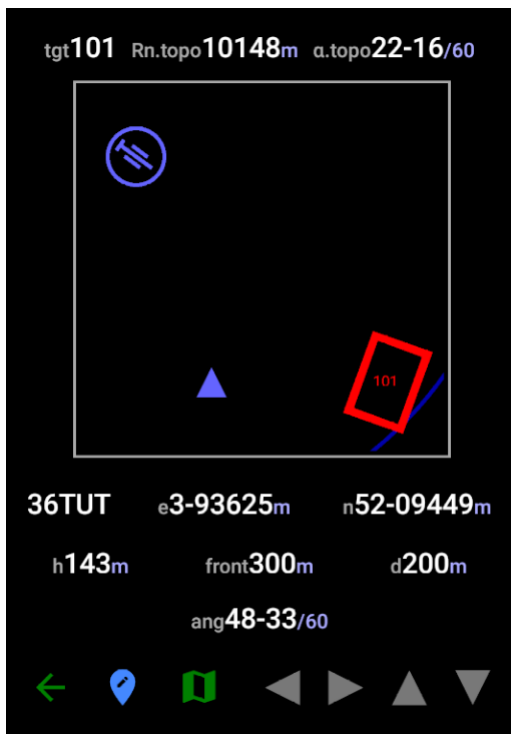
In "Target" view, if there was a photo taken from the selected observer position, then the angle of the target orientation gets replaced by azimuth, elevation, and distance from the selected observer point:
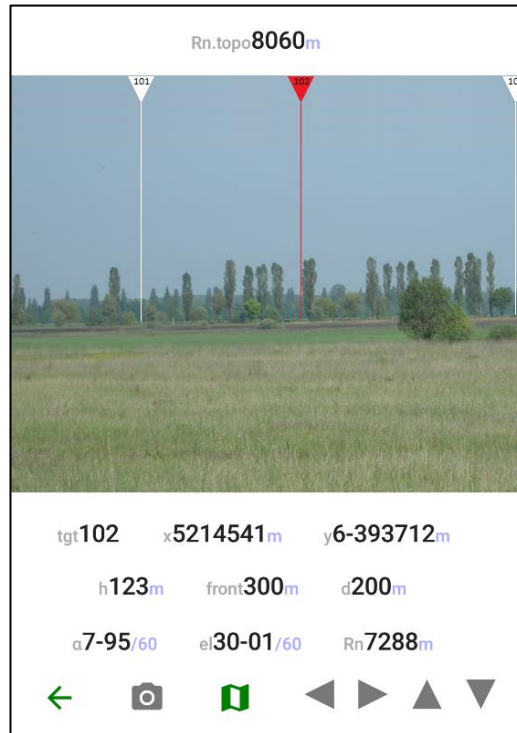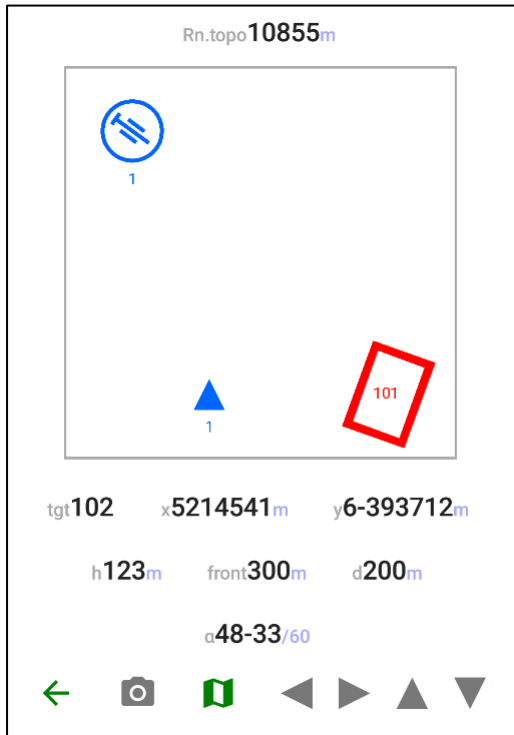
Changing these azimuth, elevation, and distance triggers automatic recalculation of the target XY coordinates and the altitude h, and vice-versa.

Navigation can also be facilitated by Google Maps:
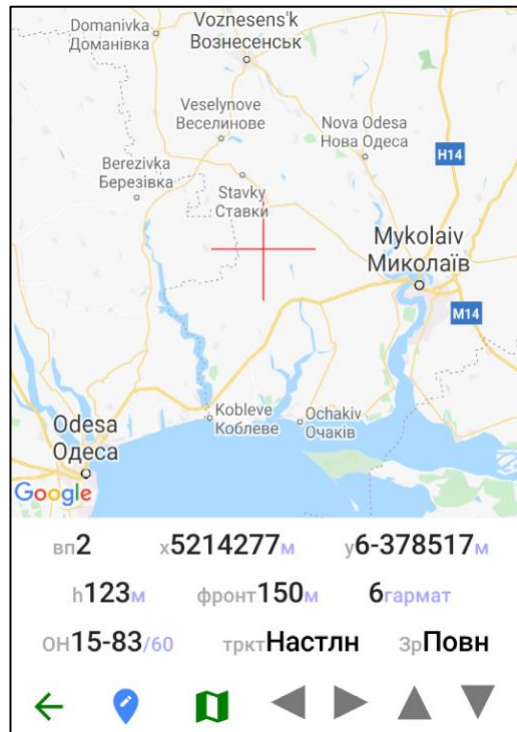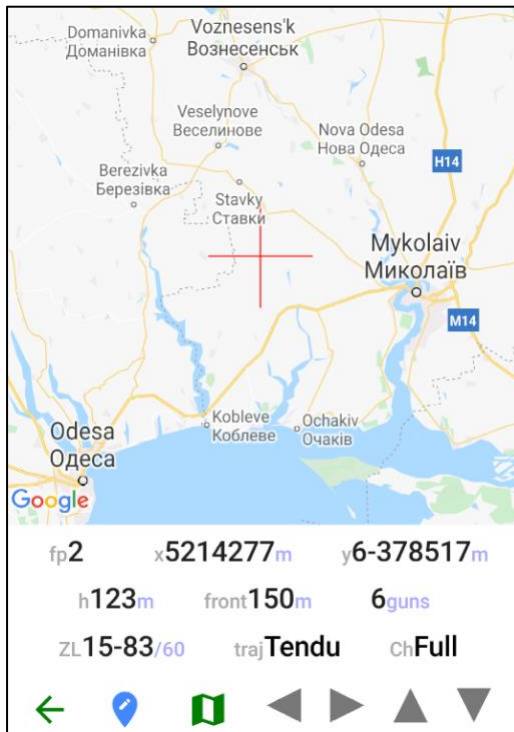
Boussole

If the device is equipped to determine its orientation, then it can be used for laying the battery. Please, note that the accuracy might be totally insufficient for your purposes.

Clicking on the home page switches on the Boussole. The true azimuth, azimuth adjusted to meridian convergence and "red-scale" are displayed on the very top of the interface.
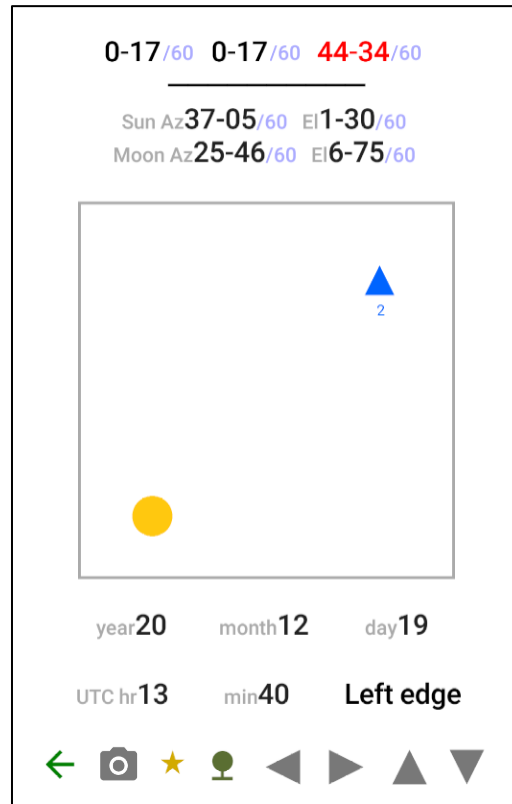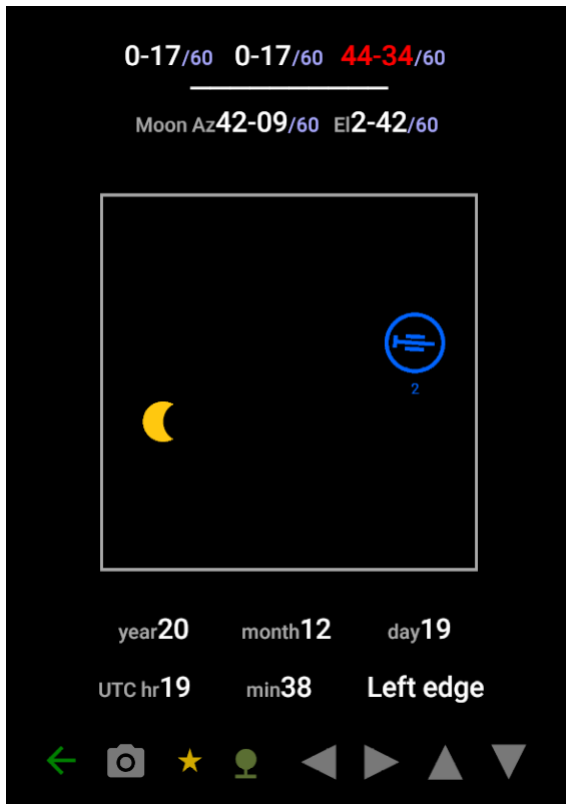
When the Sun and / or Moon are above the horizon, there are also indicated their azimuths and elevations for the selected fire position (or observer) and date/time.

The current time might be re-set to any other date/time after January 1, 2000.

The user can also select among "Left edge", "Center" and "Right edge" of the selected celestial body.

Bottom navigation bar:

←	Go to the home view without saving the selected date/time.
📷	Take a photo of a target area (observer) or a firing position (for laying the battery).
⭐	Astronavigation
🌳	Points of interest other than targets, observers or firing positions
◄ ►	Switches between firing position and observation point.
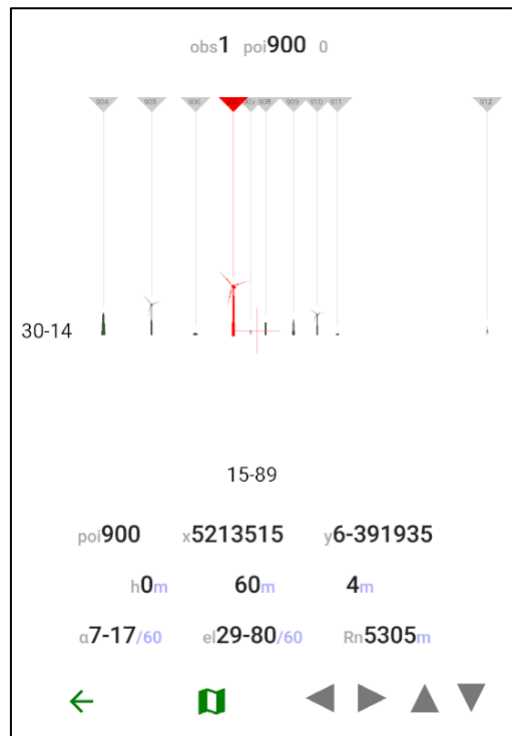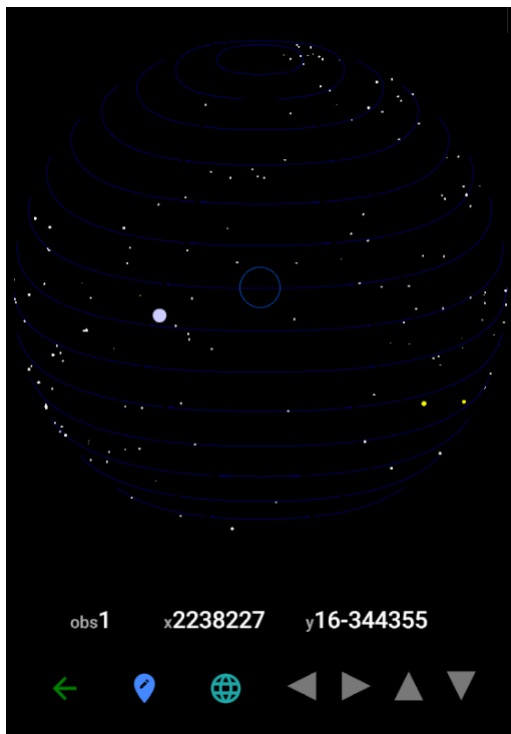
Images might be scaled up and navigated otherwise.

Clicking on the status bar (top) of the point-of-interest screen changes the selected (red) image type.

Photo

Scenarios:

- Detection of potential targets – azimuth and elevation of the pixel in the crosshair are displayed below the photo.

- Laying the battery.

- Adjustment of fire for effect by capturing the azimuth and elevation of the observed blast.

- Surveillance (not available in the current version).

To enable the above scenarios, the system automatically determines azimuth and elevation of each pixel of the taken photo (this functionality will be significantly enhanced in the future versions). The determined parameters can be manually adjusted by explicitly entering azimuth, elevation and (optionally) distance after directly clicking on the corresponding values below the photo. After the entered values are saved, the entire photo gets automatically re-calculated.

Another way of manual adjustment of the photo's azimuth and elevation, is to match one of the automatically identified objects (selected by the right-left controls) to a target (selected by the up-down controls).

In target setting, it is always assumed that the photo is taken from the selected observer's position.

Laying the battery (the "red scale" indicator) and adjustment of fire for effect by capturing the azimuth and elevation of the observed blast.

Bottom navigation bar:

|	
←	Go to the Boussole view.
🖫	Links the selected object to the selected target. The selection is made as described below.
📷	Take a photo of target area (observer) or firing position (for laying the battery)
◄ ►	Switches between automatically detected objects.
▲ ▼	Switches between targets. The selected target is red, all other are white. Only targets closer than 10km are displayed.

Adjustment of fire for effect

Schema notation:

$\times$ Observed blast   101 Target   ▲ Observer

Clicking on the schema rotates among 1) Right/Left/Over/Short and 2) N/S/E/W.
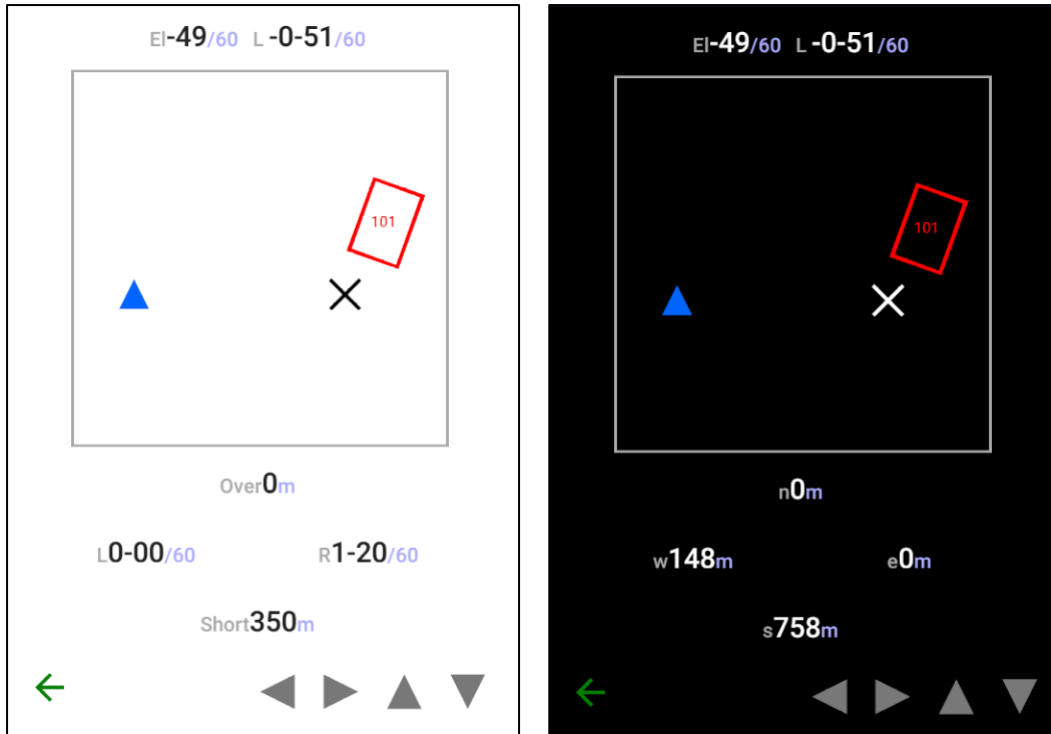
An observer inputs sensing with relation to the OT line, the calculator provides fire directions as corrections in Elevation and Azimuth.

Range is sensed as Over, Short or Target (0). Deviations are sensed as Right, Left, or Line (0).

Bottom navigation bar:

← Go to the home view without saving the entered corrections.

◀ ▶ Enter Right / Left or East / West.

▲ ▼ Enter Over / Short or North / South.

Setup

Key parameters:

- Language: English, French, German, Ukrainian

- Coordinate system: MGRS, CK42, Geo

- Interface: Day / Night

- Temperature: Censius / Fahrenheit

- Air Pressure units of measurement

- METEO-11 / METCM

Back to original settings: ⟳ + ⟲ .

Version 1	Версія 1
Navigation by clicking on icons, arrows, words or numbers. Selection from a list of items by multiple clicking.	Навігація натисканням на зображення, стрілки, слова чи числа. Вибір здійснюється кількаразовим натисканням.
English MGRS Day	Українська MGRS День
Meteo11 air.presmmHg	Метео11 атм.тискммРт
t°C α.winddegrees	t°Ц α.вітруградуси